

REMARKS

Claim 1 is amended and claim 7 is canceled herein. Claim 12 was previously canceled. Support for the amendment to claim 1 can be found, for example, in original claim 7. Hence no issues of new matter are presented herein. Upon entry of the Amendment, which is respectfully requested, claims 1-6, 8-11 and 13-21 will be all of the claims pending. Entry of the Amendment "after final" is submitted to be appropriate since Applicants are merely combining claims.

I. Claim Rejections Under 35 U.S.C. § 102

Claims 1-9 and 13-19 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Suzuki et al for the reasons of record.

It is the Examiner's position that Suzuki et al uses the same kneading process and the same composition to form the porous film disclosed therein, wherein the amount of the hydrophilic thermoplastic resin employed overlaps the claimed range. The Examiner asserts that the contact angle with water is related to the amount of the hydrophilic thermoplastic resin and therefore it is the Examiner's position that the claimed contact angle with the water of the porous sheet is an inherent property. The Examiner further asserts that porosity dictates the void distribution and the sheet of Suzuki et al meets the porosity requirement of the claims, and therefore the number of pores per m² on the surface is an inherent property.

In the response to the argument relating to the claimed liquid absorbing capacity of the film, it is the Examiner's position that since there is no evidence that the film of Suzuki et al cannot achieve a liquid absorbing capacity within the range set forth in the claims, and the porous film of Suzuki et al meets the recited structural limitations of the claimed invention, the claimed liquid absorbing capacity is an inherent property of the film of Suzuki et al. Further, the

Examiner states that products of identical composition can not have mutually exclusive properties. See Response to Arguments on page 4 of the Office Action.

With respect to claim 7, the Examiner states that Suzuki et al discloses the foam product comprising a thermoplastic resin and a powder of hydrophilic resin in an amount of 30 to 250 parts by weight per 100 parts by weight of the thermoplastic resin. The Examiner further takes the position that the extruded sheet is stretched based upon the disclosure at col. 10, lines 22-24.

Applicants respectfully traverse the rejection and submit that Suzuki et al does not disclose the presently claimed stretched porous resin film.

The present invention is directed to a stretched porous resin film which is obtained by kneading a composition consisting essentially of: (1) 30 to 100% by weight of a thermoplastic resin that comprises 5 to 100 parts by weight of a hydrophilic thermoplastic resin per 100 parts by weight of a non-hydrophilic thermoplastic resin; and (2) 0 to 70% by weight of at least one of an inorganic fine powder and an organic fine powder in an intermeshing twin extruder at a shear rate of 300 sec^{-1} or higher and which has a liquid absorbing capacity of 0.5 ml/m^2 or more as measured in accordance with the method specified in Japan TAPPI Standard No. 51-87.

Suzuki et al differs from the presently claimed stretched porous resin film in composition, form and the method for obtaining the film. Suzuki et al relates to production of resin foam by an aqueous medium, that is, a method of producing resin foam by foaming water in a resin by using the aqueous medium.

On the contrary, the present invention relates to the porous resin film prepared by kneading the thermoplastic resin comprising a hydrophilic resin under particular production conditions and then stretching. In comparison with the present invention, Suzuki et al has an

essential component the use of an aqueous medium, but the present invention does not use an aqueous medium. In Suzuki et al, the aqueous medium is described as follows: "Water is generally used as a aqueous medium, but a surface active agent, a water-soluble polymer, a polyhydric alcohol, a water-miscible organic solvent, etc. may be added as required in order to adjust the boiling point or vapor pressure of the medium, increase the affinity of the aqueous medium for the porous agglomerated particles, improve the dispersion stability of the aqueous medium during the melt-kneading of the resin compound, or to increase the uniformity of the cells of the resulting foam." Thus, in Suzuki et al, the aqueous medium is used for producing a foamed resin by evaporating moisture in the aqueous medium inside the resin during kneading. The polyhydric alcohol is exemplified as an additive of the aqueous medium, which is added for improving the dispersion stability of the aqueous medium during the melt-kneading of the resin compound.

On the contrary, in the present invention, the hydrophilic resin is more greatly dispersed in the thermoplastic resin by kneading the thermoplastic resin comprising the hydrophilic resin under the predetermined conditions. As a result, a desirable liquid absorbing capacity is obtained. This process is different from the process of Suzuki et al in that the present invention does not use an aqueous medium as in Suzuki et al.

When the resin composition contains moisture in an amount of 400 ppm or more during kneading, roughness is observed in the surface and inside of the resulting sheet and film. Thus, the commercial value of the product is lost due to bad appearance or it becomes impossible to stretch it. Further, when using fine inorganic particles such as calcium carbonate, drying in advance is carried out since the fine inorganic particles and the hydrophilic resin easily absorb

moisture. Thus, as matter of course, the person skilled in the art uses fine inorganic particles and the hydrophilic resin after sufficient drying, before kneading. As a matter of course, in Examples of the present specification, the fine inorganic particles and the hydrophilic resin were dried in an oven in advance to control the content of moisture to less than 400 ppm.

The Examiner refers to Example 2 of Suzuki et al and asserts that Suzuki et al has the same composition and is obtained by the same kneading process. However, Example 2 merely discloses the use of 10,000 g of polyethylene as a thermoplastic resin. Example 2 uses 60 g of a polyethylene glycol as a surfactant for improving a wetting property of the surface of the fine hydrophilic solid powder: calcium carbonate (column 2, line 66-column 3, line 12). The amount is different from that of the present invention as recited in amended claim 1, wherein the thermoplastic resin comprises 5 to 100 parts by weight of a hydrophilic thermoplastic resin per 100 parts by weight of a non-hydrophilic thermoplastic resin. When the amount of the hydrophilic resin is less than 5 parts by weight, due to the insufficient amount of the resin, the hydrophilic effect is lacking in uniformity and print quality (ink absorbance, uneven density and blurring) deteriorates, and the difference between the maximum value and the minimum value of the contact angle with water becomes 30° or more. When the amount of the hydrophilic resin is more than 100 parts by weight, clinging of film to a roll during molding and deterioration of stretching properties can be observed.

With respect to the kneading process, the Examples of Suzuki et al disclose only the following: 1) mixing the resins with a mixer to form a resin compound, 2) mixing the resin compound adding an aqueous medium such as a tap water, 3) producing a foamed sheet by extruding the resin compound impregnated with the aqueous medium from a circular die of a

70mm extruder (Example 1), or from a T-die of a 50mm extruder (Example 2), or similar method (the other Examples). There is no disclosure in Suzuki et al of kneading in an intermeshing twinscrew extruder at a screw shear rate of 300 sec^{-1} or higher, and therefore it cannot be said that Suzuki et al discloses the same kneading process. This is an essential feature of the process for obtaining the claimed stretched porous resin film of the present invention having the recited liquid absorption capacity. As disclosed in the present specification, if the screw shear rate is less than 300 sec^{-1} , the hydrophilic thermoplastic resin will not be sufficiently dispersed, which results in poor liquid absorptivity. Thus, since the composition and the method for obtaining the film of Suzuki et al is not the same as in the presently claimed invention, it cannot be said that the recited liquid absorption property is an inherent property.

With respect to the subject matter of claim 7, which is incorporated into amended claim 1, Applicants respectfully submit that the Examiner has misinterpreted the reference. The Examiner states that "Suzuki et al discloses the foam product comprising a thermoplastic resin and a powder of hydrophilic resin in an amount of 30 to 250 parts by weight per 100 parts by weight of the thermoplastic resin (column 2, line 62 to 63, column 5, line 29 to 30)". However, Suzuki et al refers to the hydrophilic solid powder, and not a hydrophilic resin as in the present invention, since the hydrophilic solid powder of Suzuki et al, as described on column 2, line 51 to 53, does not substantially melt at the melting temperature of the resin particles. As the Examiner states on page 4, line 11 to 13 of the Office Action, (urea resins), melamine resins and phenolic resins are exemplified as hydrophilic solid powder in Suzuki et al (column 2, line 62 to 63). These resins are substances that do not substantially melt at the melting temperature of the kneaded thermoplastic resin, based on the above-mentioned definition. On the contrary, the

hydrophilic resin in the present invention is kneaded in an intermeshing twinscrew extruder at a screw shear rate of 300 sec^{-1} or higher. Therefore it is apparent that the Examiner's statement is a misunderstanding of the disclosure.

Further, another difference between the claimed invention and Suzuki et al is that the porous resin film of the claimed invention is stretched. The Examiner states on page 2, line 2 to 1 from the bottom of Office Action that the extruded sheet is stretching in Suzuki et al, citing Example 2, column 10, lines 22 to 24. Applicants have advised that the corresponding description in the basic Japanese Patent Application of Suzuki et al states that: "the extruded sheet was rapidly cooled with air knives, and was taken over by stretching". Thus, the extruded sheet is not stretching the resin foam obtained in Example 2 has an expansion ratio of 16 (see col. 10, line 30) by way of explanation. This resin foam consists of the resin compound and air, and the volume ratio of the resin compound to air (the resin compound / air) is 1/15, therefore, this resin foam has many cells of the resulting foam, and cannot be stretched at all. The expansion ratios in the other Examples of Suzuki et al, that is, Examples 1, 3, 4 and 5 are 9.8, 7.5, 10.5 and 12.5, respectively. The resin foams in the other Examples also have many cells of the resulting foam, and cannot be stretched at all. When these resin foams are stretched, they are broken down. Accordingly, the stretched film of the present invention is different from the resin foam of Suzuki et al.

In support of the above, Applicants submit Attachment A with photo micrographs showing cross-sectional photographs of a foam sheet having an expansion ration of 3.8 and a foam sheet of the claimed invention. The upper micrograph is a cross-sectional photograph by light microscope of a foam sheet manufactured by the inventors of the present application. In the

upper micrograph, the circular portions and oval portions correspond to air layers (foam layers) and the portions other than the air layers correspond to resin layers. In general, the foam sheet shown in the micrograph is obtained by the following: the generated gas (water vapor in the cited reference) is cooped-up in a melting resin within an extruder, and at the moment that the resin is extruded from the extruder via a die, the cooped-up gas is freed from the pressure within the extruder to expand (foam) within the resin. Unless the resin in the foam sheet is cooled and solidified immediately after being extruded from the extruder, the foaming air does not become a cell, as shown in the micrograph. Thus, it is readily apparent that it is difficult to stretch the foam sheet in the micrograph by five times in a longitudinal direction and eight times in a transverse direction ($5 \times 8 = 40$ times as a dimension magnification). The foam sheet set forth in the upper micrograph has an expansion ratio of 3.8. A foam sheet as disclosed by Suzuki et al having an expansion ratio of 7.5 to 16 has a greater number of air layers than that of the foam sheet shown in the upper micrograph having an expansion ratio of 3.8, and therefore it is expected that it is more difficult to stretch a foam sheet as disclosed by Suzuki et al. Additionally, Applicants conducted an experiment to stretch a foam sheet having an expansion ratio of 16, and as a result, it was difficult to obtain a sample to observe a cross-section thereof, because there are too many layers in the foam sheet.

For reference, the lower micrograph shows a cross-sectional photograph of the claimed invention by electron microscope. It is observed that voids having a CaCO_3 nucleus (shown by the arrowhead in the micrograph) are formed. In the claimed invention, the sheet which is extruded with an extruder, does not have the voids and is a mixture of CaCO_3 and a resin. The

voids having a CaCO_3 nucleus are formed only after the obtained sheet is stretched in longitudinal and transverse directions.

In view of the above, Suzuki et al does not disclose, teach or suggest all elements of the claims and therefore cannot be said to anticipate or render obvious the claimed invention.

Accordingly, Applicants respectfully request withdrawal of the rejection.

II. Claim Rejections Under 35 U.S.C. § 103

Claim 10 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Suzuki et al and further in view of Arai et al (US '118).

The Examiner states that Suzuki et al teaches that the hydrophilic powder can be a melamine resin or a phenolic resin, but does not specifically teach that the hydrophilic powder may be an alkylene oxide polymer.

The Examiner relies on the Arai reference for the disclosure of a hydrophilic powder being an alkylene oxide polymer, melamine resin or phenolic resin.

It is the Examiner's position that it would have been obvious to one of ordinary skill in the art to employ an alkylene oxide polymer as the hydrophilic powder because of its ready availability and economic advantage.

Applicants respectfully traverse the rejection and submit that Suzuki et al does not teach or suggest all elements of the claims as discussed above and Arai et al does not remedy the deficiencies of Suzuki et al. Further, the problem to be solved by Suzuki et al is different from that of the claimed invention. As previously discussed, Suzuki et al relates to the production of a resin foam using an aqueous medium, whereas the present invention relates to preparing a stretched porous resin film by kneading a thermoplastic resin comprising a hydrophilic resin

under particular conditions and then stretching. Thus, one of ordinary skill in the art would not have had a reasonable expectation of achieving the claimed invention based upon the combination of Suzuki et al and Arai et al.

Accordingly, Applicants respectfully request withdrawal of the rejection.

Claim 11 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Suzuki et al in view of Arai et al and further in view of Fujita et al.

The Examiner states that the combination of Suzuki et al and Arai fails to teach the alkylene oxide polymer is a reaction product of an alkylene oxide compound and a dicarboxylic acid compound. The Examiner relies on Fujita et al for the teaching that an alkylene oxide polymer is a reaction product of an alkylene oxide compound and a dicarboxylic acid compound. It is the Examiner's position that it would have been obvious to one of ordinary skill in the art to employ an alkylene oxide polymer as a reaction product of an alkylene oxide compound and a dicarboxylic acid compound because this is a practical and economical method of preparing the alkylene oxide polymer.

Applicants respectfully traverse the rejection and submit that Suzuki et al and Arai et al do not teach or suggest all elements of the claimed invention as discussed above and Fujita et al does not remedy the deficiencies of the combination of Suzuki et al and Arai et al. Thus, one of ordinary skill in the art would not have had a reasonable expectation of achieving the claimed invention based upon the cited references, taken alone, or in combination.

Accordingly, Applicants respectfully request withdrawal of the rejection.


III. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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WASHINGTON OFFICE



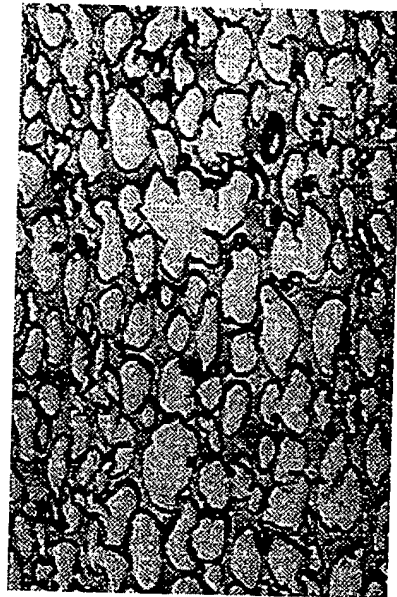
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PATENT TRADEMARK OFFICE

Date: August 21, 2003

< Foam Sheet >

(Expansion Ratio : 3.8)



500 μm

< Inventional Product >

CaCO₃



35 μm

Attachment A
U.S. Serial No. 09/841,486
Inventor: Yasuo IWASA et al.
Group Art Unit: 1771

